

Spectrometer Magnet Regulation

Closed loop application

Sat, Mar 27, 1993

This local application is designed to regulate the spectrometer magnet power supply that is used in the 400 Mev Linac upgrade to keep the magnetic field constant. The reading of the field is given by a tesla-meter that is connected to a probe placed inside the magnet near—but not too near—the beam axis. Operated in “autonomous mode,” the tesla-meter sends out a 12-character ascii serial string at 9600 baud approximately every 8 seconds. If the reading indicates a field that is too far from the nominal reference value, it is adjusted by a minimum amount to bring it closer to the reference value.

The local application parameter page that defines the parameters (in a test setup) is as follows:

```
E LOC APPL PARAMS 03/27/93 1115
NODE<0572>  NTRY< 7>
NAME=SPEC   CNTR=00EA
TITL"SPECTROMETER NMR ADJUST "
SVAR=000490F4
ENABLE  B<02A8> SPEC ENABLE
LISTNUM  <000C>
SPEC     C<0180> TSPEC           G
THRESH   C<0181> TSPTHR          G
N AVG    C<0182> TSPNAV
TESLA    C<0183> TSPECT          G
LOCKED   B<02A9> NMR LOCKED
          <0000>
          <0000>
          <0000>
```

After the Enable Bit# is the list# used for the serial data request. This is temporary and will be removed when such requests by a local application are given dynamic allocation of list#s. (Page applications use list#s in the range 0–7, so 8–13 are available for this.)

The SPEC parameter is the spectrometer magnet power supply channel#. Its reading is updated every time a new reading is received from the tesla-meter. Its setting is slowly adjusted by the algorithm. The minimal adjustment is 1.0 gauss at this writing. It is a constant in the program, so one must change the program (easily) to change it. The reference field is taken as the nominal value used for alarm checking for this channel. Change the reference value by changing the nominal value of the channel. The channel does not have to be in the alarm scan to do this, although it will presumably be so in the final installation. At this time, it is in the alarm scan, but the silent alarm flag bit is set so that alarm messages are not issued.

The THRESH parameter is a channel# whose reading specifies the threshold for regulation. If the field differs from the reference value (in absolute value) by more than this amount, a minimal adjustment is made to the D/A that controls the power supply.

The `N_AVG` parameter is a channel# whose reading specifies the number of consecutive field readings to be averaged before comparing with the reference value. It therefore provides some control over the rate at which adjustments can be made. An alternative way to change the rate is by slowing it down via jumpers in the tesla-meter. The 8-second rate is apparently the fastest one.

The `TESLA` parameter is the channel# that is set to the field reading from the tesla-meter. This is a dummy channel for the convenience of the local application to report the current reading. An entry in the data access table is used to copy this channel's reading into the `SPEC` channel above, whose analog control field references the `D/A`.

The `LOCKED` parameter is a Bit# that is set whenever a reading is received indicating the tesla-meter was "locked" when the reading was made. This indicates the health of the NMR measurement, so it is desirable if the bit is set. If the local application is disabled, this bit will be cleared; thus, when the bit is set, it means that the application is enabled *and* the last field reading was valid. This bit would presumably be included in the alarm scan in the final installation.

The tesla-meter connects to the serial port, which is plugged into the local station's serial port. In "autonomous mode" commands are not recognized as input by the tesla-meter. So if someone accidentally caused characters to be output to the serial port of that local station, they will not be misinterpreted by the tesla-meter as commands. This does, however, preclude the use of that station's serial port *input* for another purpose.

The local application source code is 380 lines. It is less than 2K bytes of executable code.